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ABSTRACT

The purpose of this project was to develop a motor performance test for preschool children that would be economical to administer, valid, and reliable. Four test items--standing long jump, hopping within an 18-inch square, balancing on one foot, and a timed gross agility task, were selected from published tests to assess children's strength, agility, and dynamic and static balance. The derived test was administered to 65 preschool-aged children between 40 and 62 months of age. Scores were correlated with coded scores of filmed observation of gross motor performance. Motor items filmed and observed were walking, running, stopping, jumping, and hopping. Consistent significant correlations of the motor performance test with the observed motor performance indicated that the instrument is generally a valid measure of the motor performance of preschool-aged boys and girls. However, the correlation between the test and observations for younger females was not significant. Therefore, it is concluded that the motor performance test can be used to assess older preschool children and male children as young as 40 months of age and to guide the development of children's motor activity programs. Included in the text are recommended practice activities for children's individual physical education programs. (RH)

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# Evaluating Motor Performance of Preschool-Aged Children

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Abstract

The purpose of this project was to develop a motor test that would be economical in administration time and would give valid and reliable results in the assessment of motor performance of preschool-aged children. The scores on a four-item motor performance test were correlated with the coded scores of a filmed observation of gross motor performance. The subjects were 65 preschool-aged children (32 boys and 33 girls) between the ages of 40 and 62 months. The motor test items were the standing long jump, hopping within an 18-inch square, one-foot balancing, and a timed gross agility task. The motor items that were filmed and observed were walking, running, stopping, jumping and hopping. Results indicated that the motor performance test is a valid measure of motor performance for young children when compared to the motor observation results.

Evaluating Motor Performance of Preschool-Aged Children

Motor performance is an essential aspect of education of young children. Acquiring skill in using one's whole body is important to the child (Cratty, 1986). This can be observed when a child practices a skill over and over until the skill is mastered to the child's satisfaction. The child is delighted with improved performance, and with this knowledge of competence, confidence in ability is increased. Assessment measures attempt to discover what the child has accomplished and to predict where the child is going, thus giving directions to teachers in providing meaningful motor learning experiences.

The basis for any motor evaluation is a broad knowledge of normal growth and development. It is important to understand that there will be many differences in the ability of children of the same age to perform general fundamental skills of walking, running, hopping, and jumping. Each child learns at a different rate and each reaches a different quality level of performance. General fundamental skills (walking, running, hopping and jumping) form the foundation for the development of other, more complex

skills for a child's later years (Zaichkowsky, Zaichkowsky & Martinek, 1980).

Assessment of motor skills is not an easy job. Many of the critical qualities of performance will defy measurement and it may be difficult to make comparisons between children on particular skills without extensive observation and administration of multiple measures. Such problems in motor assessment cause many persons involved in the education of preschool-aged children to question not only the time spent in testing, but also the validity of the results because of the age of the subjects as well as the purposes and uses of the results. However, if these concerns can be resolved through the use of an assessment instrument which is economical in administration time, then assessing young children's motor performance can facilitate the planning of curriculum the guiding of each child in appropriate activities and the communication with parents as well as the public to plan beneficial experiences for young children.

There are a number of published lists that provide a wide range of motor competencies for the assessment of young children's motor skills. The Psychomotor Individualized Educational Programs (Geddes, 1981)

includes balance and postural maintenance, locomotion and basic movements of walk, run, climbing and body mechanics. Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978) includes subtests of running speed and agility, balance, bilateral coordination, strength, upper limb coordination, response speed and subtests of visual control and upper limb speed and dexterity. The Denver Developmental Screening Test (Frankenburg, Dodds, Fandal, Kazuk & Cohrs, 1975) is a measurement designed for children and infants from newborn to age six and includes balance, hop, ball catch, forward and backward heel-toe walk. Motor Development in Early Childhood (Flinchum, 1975) is a motor ability test of throwing a ball for accuracy and distance, soccer kick, jump from height, broad jump, vertical jump, climb ladder and steps, and balance board. For the most part, these assessment tools must be administered individually by a trained specialist. In addition, some of the tests are very time consuming.

The intent of this project was to develop a motor test that would be economical in administration time and provide valid and reliable results in the assessment of motor performance of young preschool-aged children.

The four test items selected for this study were common to the foregoing published tests and were: standing long jump (strength), hopping (dynamic balance), balancing on one foot (static balance), and a timed gross agility task (agility). Each was designed to meet the following criteria:

1. Be within the performance realm of 4- and 5-year-old children.

2. Be simple enough that the children could readily understand the instructions.

3. Be of a nature that teachers in preschool programs would be able to administer the tests in a consistent manner.

4. Be complex enough for there to be a broad range of scores between good and poor performance.

5. Be economical in the amount of time necessary to administer the complete test.

## Test Description

The test descriptions and instructions are the following:

### Standing Long Jump

The standing long jump (strength) is a jump from a two-foot takeoff with the two-foot landing in front of the takeoff line. The instructions direct the child to

stand with his toes at the starting line and to jump as far forward as possible. A marker is placed at the heel landing closest to the starting line. A second trial is then taken. The farthest distance is measured and recorded in inches.

Hopping

Hopping (dynamic balance) is a series of elevations of the body from the ground by one foot, and landing on the same foot. The instructions direct the child to hop on each foot within an 18-inch square as many times as possible. The number of hops on each foot is counted, and the numbers are added together for a total score.

One-foot Balancing

One-foot balancing (static balance) requires the child to balance on each foot and to shift body posture to compensate for the change in the width of the standing base. The instructions direct the child to balance on each foot as long as possible. Time is taken until the standing foot moves. Times for each foot are taken and added together for a total score.

Gross Agility Task

The gross agility task (agility) requires the child to move in an upward and forward direction, and to change either the level of the movement or the direction

of the movement. The instructions direct the child to get up from a back lying position with heels behind the starting line as fast as possible, run around the cone five feet away, and return to a lying position on the starting mat. Two trials are given and the best time is recorded.

## Procedure

In order to evaluate the method validity and functionality of the motor performance test, the instrument was implemented with children selected from four university preschool groups. The subjects were 65 preschool-aged children (32 boys and 33 girls) between the ages of 40 months and 62 months. The children were enrolled in two morning and two afternoon preschool groups.

Each assessment session was conducted by a four-person testing team. The testing team members practiced the four-item test and test instructions on each other. This was followed with a practice session with two young children. The testing team then visited the preschool to meet the preschool children before the official testing was scheduled. Each member of the testing team wore a name tag so the children would recognize the

tester as a friend and would later willingly go to the testing site.

On the day of the testing, two testing facilities were prepared. One area included the measurements for the four-item test and the other was an area in front of an observation booth that was used for filming.

The children were measured on the four-item motor test and then were filmed walking, running, stopping, jumping and hopping. The children were directed in these activities by a member of the testing team with experience in movement education, who followed the same activity sequence with each group. The children each wore a name tag and a number that corresponded with a master list. Each child was introduced to the camera by number and first name in order that the tape evaluators who did not know the children could readily identify each child.

Four teachers with experience in motor instruction of children observed the videotape and evaluated each child on walking, running, stopping, jumping and hopping. Each skill was analyzed as a whole and was also analyzed by its parts on a scale of 5 to 1. The scores were recorded on a check sheet and were totaled. The scores of each expert for each skill were tallied

and the three closest scores were averaged for a total motor observation evaluation.

## Results

The scores on the four-item motor performance test were correlated with the coded scores of the filmed observation of gross motor performance. The raw scores from the four-item motor performance test and the motor observation were changed to T scores so that the cumulative results could be calculated. The mean score for the total four-item motor performance test was found to be 198.95 and the standard deviation was 31.46. The mean score for the total motor observation was 246.68 and the standard deviation was 28.07. The total score for the four-item motor performance test and the total score for the motor observation for the 65 children were correlated. As shown in Table 1, the correlation ($r = .465$) was significant at greater than the .01 level when the correlation was treated with the $t$ test for significance.

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Insert Table 1 about here

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There was no significant difference when the means of the total male sample and the means of the total

female sample were compared in either the motor performance test (MPT) or the motor observation (MO). The mean scores for male children were MPT: 195.74 (SD = 39.96) and MO: 228.91 (SD = 61.29) and the mean score for female children were MPT: 195.91 (SD = 37.76) and MO: 234.73 (SD = 58.48).

Data were also compared by gender and age to determine if the motor performance test would be an effective instrument for use with both older and younger preschool males and females. Motor performance test scores and motor observation scores correlation by gender and age are presented in Table 1.

When the total scores of the 60-month children were compared on the MPT and MO, it was found that the correlation was significant at greater than the .01 level. The relationship of the scores of the males was significant at the .01 level and the relationship of the scores of the older females was significant at greater than the .05 level (see Table 1).

When the total scores of the 48-month and younger children were compared on the MPT and MO it was found that the correlation was not significant. When the scores for the younger males were compared, it was found that the relationship was significant at greater than

the .05 level. The relationship of the scores of the younger females were found to be nonsignificant (see Table 1).

When only the scores of the younger and older male children were compared, the correlation was found to be significant at the .01 level. The same was true for the correlation of the younger and older female children (see Table 1).

## Discussion and Application of Findings

The consistent significant correlations of the motor performance test with the observed motor performance indicate the instrument is a valid measure of motor performance of preschool-aged boys and girls. The test is not gender dependent because the scores of the male children and female children were not significantly different. However, when younger females were isolated, the correlation of MPT and MO scores was not significant. This may have been due to sample size or perhaps the young females were more inconsistent in performance and not really physically deficient. The test can be used with the oldest children and with male children as young as 40 months of age as a measure of motor performance.

The challenge for evaluating young children's motor skills should not focus on whether the testing should be done, but rather what should be done with the test results. One of the purposes of evaluation is for the child to be led in activities that will result in improved performance in selected skills. The results of the motor performance test should be used to determine the status of the child in motor performance. The results also should be used to guide activity selection that will provide practice in the basic motor skills. The results should not be used to group or promote children into more advanced experiences.

Preschool teachers can provide a testing facility in an area separate from the activities of the day. A small room or hallway will provide the quiet isolation needed for a good testing environment. The four test stations should be set up. A teacher can manage four to five children and test each child on all four items in a short time.

Table 2 includes raw scores and the T score equivalents. These T scores allow measurements of different values to be added together for a cumulative score. There is an assumed mean of 50 and the raw score mean has been placed at T score 50. A child's

individual performance can be assessed as being above or below the mean. For example, a child scored 5.41 on the agility test for a T score of 52; hopped 11 times for a T score of 45; balanced on each foot a total of 46.5 seconds for a T score of 67; and long jumped 40 inches for a T score of 59. It can be observed that this child scored above the mean T score of 50 in each of the tests except the hopping test on which a T score of 45 was registered. Activities that strengthen hopping skills should be provided in the activity program for this child.

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Insert Table 2 about here

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The child's cumulative T score of 223 can be compared with the cumulative T scores of each of the children in the group to determine placement rank order. The individual T scores and the cumulative T scores can be used for activity selection in the physical education program.

The following activities are suggested to provide practice in the items of the motor performance test. These activities will strengthen the skills required by

the test. They should be included in a child's individual physical education program.

Standing Long Jump (strength)

A. Jumping over lines. When the child gains proficiency at a certain distance, widen the distance between the lines.

B. Jump and reach. The child reaches for chalk marks on a wall which keep getting higher.

C. Jump the shot. The child jumps a rope with a weighted end (towel tied to the end of the rope) as it is swung in a circle past the child.

D. Single and long jump rope skills.

Hopping (dynamic balance)

A. Hop scotch. The teacher designs any pattern of hop scotch so hopping and also jumping are included.

B. Hop relay race. The child hops to the designated end line and back.

C. Rhythm hopping. The child hops ten times on each foot. The teacher can clap the rhythm and count.

D. Hop in and out of an individual circle. The child hops in and out of a hoop on the floor ten times on each foot.

Balancing (static balance)

A. Statues. The child runs around the room, stops on signal and balances on one foot.

B. Poses and change. The child selects a pose and holds for 10 counts and changes to another pose.

C. Jump quarter turn and hold. The child jumps a quarter turn to the right and holds the pose. Continue with quarter turn.

D. Walk on a line. The child walks down a line on the floor and progresses to walking in various ways on a low balance beam.

Agility Measure (agility)

A. Obstacle course. The child follows, as fast as possible, an obstacle course that includes changes of direction, change of level and stopping and starting.

B. Potato race. The child runs to station one, returns to starting line, runs to station two, returns to starting line and runs to station three and returns to starting line.

C. Jump forward and backward over a line. The child jumps forward over a line and jumps backward over a line ten times.

D. Jump sideways over a line and back. The child jumps sideways and back over a line ten times.

## Summary

Motor performance of young children and the assessment of motor performance should be included in the instructional program of preschool-aged children. The motor performance test used for this study can be a tool for assessing motor performance of this preschool age group. The teacher should use the tests results to design a motor activity program that will give experience in and provide practice for strengthening any motor weakness as indicated by the test results.

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Table 1

Correlations and t-test Results of Motor Performance Test

| Group by Age | r | t | p |
|---|---|---|---|
| 40-48 Months: | | | |
| Males (n=6) | .841 | 3.107 | .05 |
| Females (n=8) | .366 | .963 | ns |
| Total (n=14) | .484 | 1.916 | ns |
| 60-62 Months: | | | |
| Males (n=9) | .760 | 3.095 | .01 |
| Females (n=9) | .674 | 2.416 | .05 |
| Total (n=18) | .724 | 4.198 | .01 |
| 40-48 Months and 60-62 Months: | | | |
| Males (n=15) | .809 | 4.959 | .01 |
| Females (n=17) | .627 | 3.117 | .01 |
| Total (n=32) | .637 | 4.527 | .01 |
| Total Sample (N=65) | .465 | 4.168 | .01 |

Table 2

T-score Table for Evaluating Scores on Motor Performance Test

| T-score | Long Jump | Balance | Hopping | Agility |
|---|---|---|---|---|
| 83 | | 73.3 | | |
| 82 | | 71.6 | 101 | |
| 81 | | 69.5 | 100 | |
| 80 | | 67.7 | 98 | |
| 79 | | 65.5 | 95 | |
| 78 | | 64.9 | 93 | |
| 77 | | 63.7 | 89 | |
| 76 | | 62.1 | 87 | |
| 75 | | 60.5 | 85 | |
| 74 | 52 | 59.1 | 83 | |
| 73 | 51 | 56.5 | 80 | |
| 72 | 50 | 55.1 | 77 | |
| 71 | | 53.2 | 75 | |
| 70 | 49 | 51.3 | 73 | |
| 69 | 48 | 50.2 | 70 | |
| 68 | 46 | 47.7 | 68 | |
| 67 | | 46.5 | 65 | |
| 66 | | 45.5 | 63 | |
| 65 | 45 | 43.6 | 61 | |

(table continues)

| | | | | |
|---|---|---|---|---|
| 64 | 44 | 42.5 | 58 | |
| 63 | 43 | 39.6 | 54 | 3.5 |
| 62 | | 37.3 | 52 | 4.0 |
| 61 | 42 | 36.8 | 49 | 4.1 |
| 60 | 41 | 35.2 | 47 | 4.2 |
| 59 | 40 | 33.9 | 44 | 4.4 |
| 58 | 39 | 31.5 | | 4.6 |
| 57 | | 30.0 | 40 | 4.7 |
| 56 | 38 | 28.7 | 37 | 4.8 |
| 55 | 37 | 27.3 | 35 | 5.0 |
| 54 | 36 | 26.0 | 33 | 5.1 |
| 53 | | 23.5 | 30 | 5.2 |
| 52 | 35 | 21.3 | 27 | 5.4 |
| 51 | 33 | 19.6 | 25 | 5.5 |
| 50 | | 18.0 | 22 | 5.7 |
| 49 | 32 | 16.7 | 20 | 5.8 |
| 48 | | 14.7 | 18 | 5.9 |
| 47 | 31 | 13.1 | 15 | 6.0 |
| 46 | 30 | 11.2 | 12 | 6.2 |
| 45 | 29 | 9.8 | 10 | 6.3 |
| 44 | | 8.5 | 8 | 6.5 |
| 43 | 28 | 6.9 | 5 | 6.6 |
| 42 | 27 | 4.9 | 2 | 6.7 |

(table continues)

| | | | |
|---|---|---|---|
| 41 | 26 | 3.7 | 6.8 |
| 40 | 25 | 2.5 | 7.0 |
| 39 | | 1.0 | 7.2 |
| 38 | 24 | | 7.3 |
| 37 | 23 | | 7.4 |
| 36 | | | 7.6 |
| 35 | 22 | | 7.7 |
| 34 | 21 | | 7.8 |
| 33 | 20 | | 7.9 |
| 32 | 19 | | 8.0 |
| 31 | 18 | | 8.1 |
| 30 | | | 8.3 |
| 29 | 17 | | 8.5 |
| 28 | 15 | | 8.6 |
| 27 | | | 8.7 |
| 26 | 14 | | 8.9 |
| 25 | | | 9.1 |
| 24 | 13 | | 9.2 |
| 23 | 12 | | 9.3 |
| 22 | 11 | | 9.4 |
| 21 | | | 9.5 |
| 20 | 10 | | 9.7 |